UTTAR PRADESH JOURNAL OF ZOOLOGY

41(24): 71-75, 2020
ISSN: 0256-971X (P)

DEXMEDETOMIDINE AS AN ADJUNCT TO SPINAL ANESTHESIA IN INTRATHECAL VERSUS INTRAVENOUS DEXMEDETOMIDINE LOWER LIMB ORTHOPEDIC SURGERIES

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Authors NVK and JARA designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors SVN and AG managed the analyses of the study. Authors DNK, RMM and PBP managed the literature searches. All authors read and approved the final manuscript.

Article Information

Editor(s):
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Reviewers:
(1) Arpad Solyom, University of medicine and pharmacy, Romania.
(2) Ana Henriques Mota, Universidade de Lisboa, Portugal.

Received: 28 October 2020
Accepted: 02 January 2021
Published: 28 January 2021

Original Research Article

ABSTRACT

Purpose of the study was to compare about beginning and time period of sensory and motor block, hemodynamic security, duration of analgesia and symptoms between two groups. This study was performed in 60 American Society of Anesthesiologists I / II patients undergoing orthopaedic surgery in the lower limb at Krishna Hospital, Karad. Patients were randomly assigned to the IT and IV groups. Before Subarachnoid block (SAB) in IV group dexmedetomidine was given bolus 1 µg/kg over 10 min and then after SAB 0.5 µg/kg/hr throughout surgery. In IT group equal volumes of normal saline were infused before and after SAB. In IT group with 3ml bupivacaine 5 µg dexmedetomidine was added intrathecally. While in IV group equal volume of normal saline was added in SAB.

Keywords: Intravenous dexmedetomidine; intrathecal; bupivacaine; low limb orthopaedic surgery.

1. INTRODUCTION

Pain is intrinsic to all medical procedures causing huge horribleness. Perioperative pain the executives has been a significant test for anesthesiologists and there has been a consistent struggle to bring out the best pain relieving method with least results. Provincial anaesthesia and analgesia can possibly

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provide great operating conditions and delayed post usable pain relief [1]. It is also known to decrease post-operative morbidity and mortality due to its beneficial benefits, such as increased blood flow and maximum tissue functioning and improved recovery, resulting in widespread use [2]. Dexmedetomidine is a highly selective α2-adrenoceptoragonist recently introduced to anaesthesia. It produces dose-dependent sedation and analgesia without respiratory depression [3,4]. It was primarily used for intravenous sedation [5]. When dexmedetomidine was administered intravenously before spinal anesthesia [6] or as a loading dose accompanied by continuous infusion during surgery [7], the duration of spinal anaesthesia was also increased.

2. REVIEW OF LITERATURE

Ahmed M.S. Hamed, Sahar M. Talaat [8]: Sixty adult patients defined as ASA I or ASA II and scheduled for lower limb orthopaedic surgery under spinal anaesthesia. Patients were automatically allocated to one of the three groups. Group B (n = 20) was injected with 10 ml isotonic saline intravenously over 5 min immediately after patient has received intrathecal hyperbaric bupivacaine 12.5 mg; group IV (n = 20) was injected with dexmedetomidine 0.5 µg/kg intravenously diluted in 10 ml isotonic saline over 5 min immediately after patient has received intrathecal hyperbaric bupivacaine 12.5 mg; and group IT (n = 20) was injected with 10 ml isotonic saline over 5 min immediately after patient has received intrathecal hyperbaric bupivacaine 12.5 mg and dexmedetomidine 3 µg. Rachana Joshi, et al [9] 2013: The study included 50 patients of ASA grade included / of deployed for lower abdominal surgery. Patients were divided into 2 groups: group B receiving (n = 25) receiving 0.9% normal saline 0.2 ml internally 0.5% heavy buvivicine 3 ml (15 mg), group BD received (n=25) received 0.5% heavy bupivacaine 3 ml (15 mg) with dexmedetomidine 0.05 ml (5 µg) and 0.9% normal saline 0.15 ml intrathecally.

Hong et al. [10] evaluated the impacts of intravenous dexmedetomidine on low-portion bupivacaine spinal anaesthesia in 51 old patients going through transurethral resection of the prostate. Whizar-Lugo et al. [11] examined the impact of intravenous dexmedetomidine versus intravenous clonidine on bupivacaine spinal anaesthesia. 75 patients going through abdominal hysterectomy under bupivacaine spinal sedation (15 mg 0.5% hyperbaric bupivacaine) were randomly categorized into three groups.

3. AIM AND OBJECTIVES

To evaluate the effects of dexmedetomidine administered intrathecally or intravenously in prolongation of spinal anaesthesia using bupivacaine in patients undergoing lower limb orthopaedic surgery.

Hemodynamic parameters in perioperative period. Time of first requirement of analgesia. Time of onset and duration of sensory and motor blockade.

4. MATERIALS & METHODS

This a prospective randomized comparative study was conducted in 60 adult patients aged between 18-60 years undergoing elective lower limb orthopaedic surgeries under spinal anaesthesia in Krishna Hospital, Karad. Calculated by statistical software Open Epi version 3, with power of study 95% & confidence interval of 95%, it comes to minimum of 19 in each group, but I have selected sample size of 30 in each group.

5. OBSERVATION AND RESULTS

Table 1. Pre-induction HR in group IT and group IV

Pre-induction HR	Group IT (n=30)	Group IV (n=30)	Unpaired 't' test value of student	'P' value
	Mean ± SD	Mean ± SD		
0min	80.47±7.40	80.07±7.34	0.07	p>0.05
5min	80.13±7.72	74.23±7.16	3.06	p=0.03
10min	80.0±8.45	72.00±6.72	4.06	p=0.01
*Paired 't' test value of student	0.21	6.31		
'P' value and significance	p>0.05,	p=0.001, significant		

**By applying Paired 't' test of student, Group IV showed significant decrease in mean values of pre-induction heart rate from 0 min to 10 min. While, in group IT no significant decrease in HR seen. (p=0.001).*

*** By applying Unpaired 't' test value of student, the mean values of pre-induction heart rate in Group B is significantly lower than in Group IT. [According to Table 1]*

Table 2. Pre-induction SBP in group IT and group IV

Pre-induction SBP	Group IT (n=30)	Group IV (n=30)	Unpaired 't' test value of student	'P' value and significance
	Mean ± SD	Mean ± SD		
0min	129.83±13.66	126.46±10.54	1.26	p>0.05
5min	130.53±13.16	122.93±10.91	3.13	p=0.01
10min	129.87±13.25	120.87±10.68	3.10	p=0.005
*Paired 't' test value of student	0.14	4.57		
'P' value and significance	p>0.05, not significant	p=0.001, significant		

**By applying Student's Paired 't' test, Group IV showed significant decrease in mean values of pre-induction SBP from 0 min to 10 min. While, in group IT no significant decrease in SBP seen. (p=0.001)*

*** By applying Student's Unpaired 't' test, the mean values of pre-induction SBP in Group IV is significantly lower than in Group IT. [According to Table 2]*

Table 3. Pre-induction DBP in group IT and group IV

Pre-induction DBP	Group IT (n=30)	Group IV (n=30)	Unpaired 't' test value of student	P value
	Mean ± SD	Mean ± SD		
0min	81.66±7.39	82.00±6.58	0.46	p>0.05
5min	79.80±7.86	74.66±6.89	1.97	p=0.009
10min	80.53±7.22	73.40±5.92	4.59	p=0.01
*Paired 't' test value of student	0.97	4.59		
'p' value and significance	p>0.05, not significant	p=0.001, significant		

**By applying Paired 't' test of student, Group IV showed significant decrease in mean values of pre-induction DBP from 0 min to 10 min. While, in group IT, no significant decrease in SBP seen. (p=0.001)*

*** By applying Student's Unpaired 't' test, the mean values of pre-induction DBP in Group IV is significantly lower than in Group IT. (p=0.001) [According to Table 3]*

Table 4. Intraoperative systolic blood pressure (SBP) (mm of Hg) in group IT and group IV

SBP (mm of Hg)	Group IT (n=30)	Group IV (n=30)
	Mean ± SD	Mean ± SD
0 min.	120.4±12.67	120.86±9.68
1 min.	120.26±12.72	120.73±10.64
3 min.	119.13±12.40	119.13±10.24
5 min.	118.17±12.31	116.33±9.61
10 min.	115.60±12.06	114.20±8.79
15 min.	109.80±11.47	110.80±8.76
30 min.	109.13±11.69	108.26±8.44
60 min.	107.13±11.52	106.20±7.36
90 min.	103.87±10.87	103.53±7.19
120 min.	121.40±11.09	121.06±5.54
Student's Paired 't' test value	1.64	1.48
'P' value and significance	p=0.16, not significant	p=0.21, not significant

There is no significant difference between intraoperative SBP in Group IT and Group IV by applying the Student's Unpaired 't' test. Also, By applying Student's Paired 't' test, there is no significant decrease/increase in mean values of intraoperative heart rate from 0 min to 120 min, in group IT and in group IV. [According to Table 4]

6. DISCUSSION

This study found that dexmedetomidine whether administered intravenously or intrathecally did not accelerate the onset of spinal sensory anesthesia (p-0.12) or affect the maximum block level but significantly prolonged the DSA. Results of the study conducted by Harsoor et al. [12] are in agreement

with the study. They studied the effect of a low-dose intravenous dexmedetomidine supplement (which was given as intravenous bolus 0.5 µg/kg then infusion 0.5 µg/kg/h) on characteristics of bupivacaine spinal anaesthesia. They revealed that organization of intravenous dexmedetomidine during intrathecal block affixed the beginning of tangible square and delayed the span of tactile and engine block with good arousable anaesthesia. Intrauterine heart rate was significantly reduced with intravenous dexmedetomidine from 30 to 60 minutes. However, MAP was significantly low from 60 min until end of surgery and for the initial 2 hr post-operatively, and this may be because of the continuous dexmedetomidine infusion 0.5 µg/kg/hr.

Ahmed M.S. et al. [8] with respect to the hemodynamic variables measured during the intraoperative period, the mean values of the heart rate were significantly decreased starting at 20 min until 60 min in group IV in comparison with the other two groups ($P < 0.05$). There were no significant differences between groups in the heart rate values recorded during the postoperative period ($P > 0.05$). Systolic and diastolic blood pressure values were comparable among the three groups throughout the study period. Systolic and diastolic blood pressure falls significantly in group B as compared to group A. While there is no change in intraoperative systolic (p-0.164) and diastolic (p-0.197) blood pressure in both the groups. These results are comparable with previous studies. Our study results were similar and in accordance with results found by Kanazi et al. [13] and Mustafa et al. [14].

Side effects-incidence of hypotension was seen 6% cases in IT group while in IV group incidence was 13%. Incidence of bradycardia was also 6% in IT group while in IV group it was significantly more that is 16%.while incidence of shivering was seen only 2 cases each out of 30 in both the groups. Thus in our study incidence of bradycardia and hypotension was more in intrathecal group than intravenous group, which were treated with atropine and phenylephrine respectively. Our study results were similar in accordance with previous studies. Ahmed et al. [8] found that with respect to haemodynamics, the heart rate values were significantly decreased starting at 20 min until 60 min in group IV in comparison with the other two groups, but blood pressure values were comparable throughout the study period.

7. CONCLUSION

Intrathecal dexmedetomidine intrinsically increases the duration of sensory and motor block of bupivacaine spinal anesthesia compared to dexmedetomidine, with preserved hemodynamic stability. Dexmedetomidine is a great intrathecal adjuvant than neostigmine due to quicker onset of anaesthesia, better intra-and post-operative analgesia and longer period of motor and sensory blockage without a substantial rise in adverse effects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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